



FUNCTIONAL OUTCOME OF EARLY STAGES OF OSTEOARTHRITIS KNEE TREATED WITH BONE MARROW ASPIRATE CONCENTRATE AND INTRAARTICULAR STEROID

Dr. K Parthasarathi Naik

MS ORTHO, ASSISTANT PROFESSOR, Department of Orthopaedics, Navodaya Medical College, Navodaya Nagar, Mantralayam Road, Raichur, Karnataka, India.

Dr. Shankarlinga Sajjan

MS ORTHO, ASSISTANT PROFESSOR, Department of Orthopaedics, Navodaya Medical College, Navodaya Nagar, Mantralayam Road, Raichur, Karnataka, India.

ABSTRACT

Objectives: The objective is to observe the functional outcome of early stages of osteoarthritis knee treated with Bone marrow aspirate concentrate (BMAC) and Intraarticular steroid **Methods:** A total of 60 patients of both genders aged 45–60 years were included in the study. 5ml - 10ml of Bone marrow was aspirated under local anaesthesia from iliac crest, ipsilateral / contralateral to the knee, with a bone marrow aspiration needle and was centrifuged and processed. 40 mg of Triamcinolone was mixed with BMAC and was administered in the knee joint. This procedure was done under Day Care. **Results:** At 6-month follow-up, BMAC injection with 40 mg triamcinolone significantly improved knee pain and function. **Conclusion:** BMAC injection with 40 mg triamcinolone significantly improved knee pain and function in early stages of osteoarthritis knee

KEYWORDS : Bone marrow aspirate concentrate (BMAC) , Intraarticular steroid , osteoarthritis knee

INTRODUCTION

Articular cartilage has been well-known for low spontaneous healing potential since it may lack vessels and undifferentiated cells, and the presence of specialized cells with low mitotic activity^{1,2}. Therefore, once damaged, it may eventually progress to osteoarthritis (OA). OA is a destructive joint disease, causing degeneration of cartilage, osteophyte formation, and changes in periarticular bone, resulting in disability^{3,4}. To our knowledge, there has been no approved, established treatment that can reverse the progression of OA or destruction of articular cartilage⁵. Although several studies have been conducted on disease modifying strategies of OA at the molecular level that block inflammatory pathways and enhance cartilage protective function^{6,7}, there have still been limitations in establishing the optimal treatment options. Moreover, from microfracture to osteochondral autologous transplantation, various surgical techniques for cartilage regeneration have been introduced^{8,9,10}. However, the current therapies are still palliative, and there has been no optimal regenerative method for OA with cartilage degeneration. Recently, bone marrow aspirate concentrate (BMAC) has emerged as a possible alternative for regenerative medicine. It has been spotlighted as a promising biologic tool because of a rich source of pluripotent mesenchymal stem cells (MSCs) and growth factors^{11,12}, and currently approved by the United States Food and Drug Administration (FDA). Accordingly, considering both the anti-inflammatory and regenerative effect, BMAC may be an attractive tool for cartilage regeneration in OA.

There are 5 injectable corticosteroids that have a current Food and Drug Administration (FDA) label for IA injections. These consist of methylprednisolone acetate, triamcinolone acetate, betamethasone acetate and betamethasone sodium phosphate, triamcinolone hexacetonide, and dexamethasone.

Mechanism of action

The action mechanism of BMAC is not yet fully understood¹³. In order to analyze the exact mechanism of BMAC, an understanding of the presence of MSCs in BMAC must be preceded. Most of all, the MSCs within BMAC will potentially provide a direct cell source for tissue repair. Additionally, the nucleated cells may have a paracrine effect by delivering various growth factors and cytokine into the lesion site to promote tissue healing and immunomodulation^{13,14,15}. After density gradient centrifugation, the harvested cells may be concentrated six to seven times, so that cellular content in

BMAC can explode several growth factors, such as PDGF, TGF- β , and VEGF¹¹. These growth factors are within the α -granules of platelets and are secreted by MSCs¹⁶, which have high chondrogenic potential^{12,17}. PDGF, TGF- β , and other factors such as IGF-I also serve as chemoattractant.

MSCs also have an immunosuppressive effect by adjusting the activation of natural killer cells, dendritic cells, macrophages, and T and B lymphocytes^{18,19,20}. Thus, MSCs have advantageous anti-inflammatory and antifibrotic actions to maximize their therapeutic effects in lesion site^{21,22,23}.

Corticosteroids have both anti-inflammatory and immunosuppressive effect, but their mechanism of action is complex. Corticosteroids act directly on nuclear steroid receptors and interrupt the inflammatory and immune cascade at several levels. By this means, they reduce vascular permeability and inhibit accumulation of inflammatory cells, phagocytosis, production of neutrophil superoxide, metalloprotease, and metalloprotease activator, and prevent the synthesis and secretion of several inflammatory mediators such as prostaglandin and leukotrienes^{13,14}. The clinical anti-inflammatory reflections of these actions are decreases in erythema, swelling, heat, and tenderness of the inflamed joints and an increase in relative viscosity with an increase in hyaluronic acid (HA) concentration^{13,15}.

METHODS

A total of 60 patients of both genders aged 45–60 years were included in the study. 5ml - 10ml of Bone marrow was aspirated under local anaesthesia from iliac crest, ipsilateral / contralateral to the knee, with a bone marrow aspiration needle and was centrifuged and processed. 40 mg of Triamcinolone was mixed with BMAC and was administered into the knee joint.

This procedure was done under Day Care.

Procedure was done after obtaining informed written consent. Demographic and clinical data of the patients (age, sex, duration of disease, weight, height, most affected knee, Kellgren-Lawrence radiographic evidence) were collected at first visit. We also noted the current use of analgesics, NSAIDs, opioids, chondroprotective agents. These drugs were made to remain stable during the course of study and no new pharmacological or nonpharmacological intervention was added during the course.

Kellgren and Lawrence classification system have been used in this study

Kellgren and Lawrence classification system

- Grade 0 (none): definite absence of x-ray changes of osteoarthritis
- Grade 1 (doubtful): doubtful joint space narrowing and possible osteophytic lipping
- Grade 2 (minimal): definite osteophytes and possible joint space narrowing
- Grade 3 (moderate): moderate multiple osteophytes, definite narrowing of joint space and some sclerosis and possible deformity of bone ends
- Grade 4 (severe): large osteophytes, marked narrowing of joint space, severe sclerosis and definite deformity of bone ends

Inclusion Criteria

1. Age between 45-60 years both gender with OA knee stages 1&2

Exclusion Criteria

1. Known allergy to intra-articular injection
2. Hepatic/renal/cardio-pulmonary abnormality
3. Bleeding diathesis
4. Local skin infections

Patients were evaluated for pain relief by VAS and clinical and functional outcome by Knee society score before and after the procedure

All the patients were informed to come for follow up at, 1 month, 3 months and 6month

RESULTS

For the study we enrolled 60 patients aged 45-60 years, 3 of them refused to be the part of study as they were not able to show up for follow up. So we conducted the study in the rest 57 patients. The visual analogue score (VAS) and Knee society score(KSS) for both clinical and functional components were tabulated in table 1 . We had no case of any adverse drug reaction and other complications following intraarticular injection

VAS	PRE INJ	1MONTH	3MONTH	6MONTH
KSS	7.1	4	4.4	7.1
Clinical	55	75	65	60
Functional	66	66	67	66

DISCUSSION

In our study we observed that there was significant amount of improvement in pain after intra articular injection with a mixture of BMAC and 40 mg Triamcinolone.

The VAS was reduced to a mean of , 4, 4.4 from the base line of 7.1 at, 1st month and 3rd month respectively and the value increased to preinjection values at the end of 6th month,

The knee society clinical score of improved to a mean of 75, 65 and 60 from the baseline score of 55 on, 1st month, 3rd month and 6th month respectively

However The knee society functional score remained almost unaltered throughout the study.

CONCLUSION

We conclude that use of BMAC and Triamcinolone as intraarticular in early stages 1 &2 was effective as there was significant reduction of pain on Visual analogue score (VAS) and Knee society scores (KSS).

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